

5.2 Permutations and combinations

Name: _____ Class: _____ Date: _____

Total: 11 marks**KEY WORDS** permutations and combinations 排列与组合 • combination 组合 • permutation 排列

Objective

Build the skills to answer exam questions on **permutations and combinations** 排列与组合 — counting arrangements (order matters) and selections (order does not), including repeated objects and restrictions.

You must be able to:

- use nP_r for arrangements and nC_r for selections
- arrange objects with repeats (divide by each repeat factorial)
- count with restrictions (e.g. items together / not together)

1 Worked examples

■ Arrangements & selections



Counting outcomes underlies both combinatorics and probability

Arranging 3 of 4 objects (4P_3)

$$\boxed{4} \times \boxed{3} \times \boxed{2} = 24$$

1st pick 2nd pick 3rd pick

$$\text{Choosing 3 of 4 (order ignored): } {}^4C_3 = \frac{{}^4P_3}{3!} = 4$$

$${}^nP_r = n! / (n - r)! \quad \cdot \quad {}^nC_r = {}^nP_r / r!$$

Arrange (order matters, nP_r) versus choose (order ignored, nC_r)

Arrangements of NEEDLESS (8 letters, E $\times$ 3, S $\times$ 2): $\frac{8!}{3!2!} = 3360$.

Choosing 3 from 10 (order doesn't matter): ${}^{10}C_3 = \frac{10!}{3!7!} = 120$.

2 Practice

2.1 Evaluate 7P_3 . [1]

2.2 Evaluate 8C_2 . [1]

3 Exam-style questions

3.1 The number of ways to arrange the letters of BANANA is: [1]

A	B
C	D

A 720

B 120

C 60

D 360

3.2 A committee of 4 is chosen from 7 women and 5 men.

(a) Find the number of possible committees. [2]

(b) Find the number that contain exactly 2 women and 2 men. [3]

3.3 Find the number of arrangements of the 7 letters of PICTURE in which the three vowels (I, U, E) are all together. [3]
